MicroNano Tec/Hannover Messe 2011
"Innovations of Industry"
4th April, 2011, Hannover, Germany

The landscape of Japanese MEMS R&D and Industry

April, 2011
Micromachine Center, Japan

(MEMS:Micro Electrical Mechanical System)

Outline

- Brief introduction of Micromachine Center
- Advantages and Issues of Japanese MEMS Industry
- Comparing Supply-chain in USA, Europe, and Japan
- Foundation of Micro-nano open innovation Center(MNOIC)

Micromachine Center (MMC)

Nonprofit foundation established in January, 1992, and authorized by Ministry of Economy Trade and Industry, (METI)

Mission:

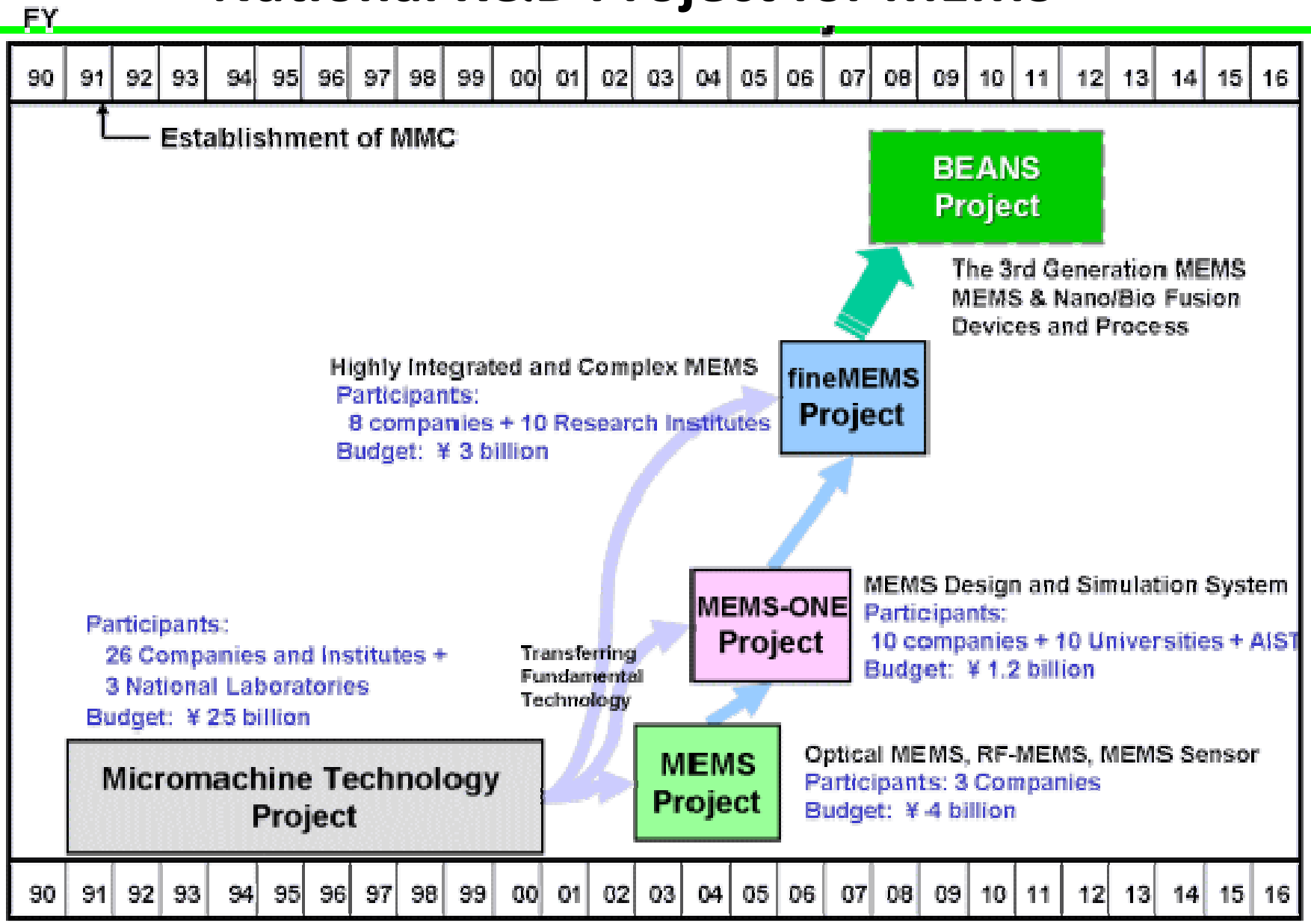
Supporting establishment of future technologies and Industrialization for MEMS

Planning of National R&D projects, Micromachine Exhibition etc in cooperation with government, academy and industry

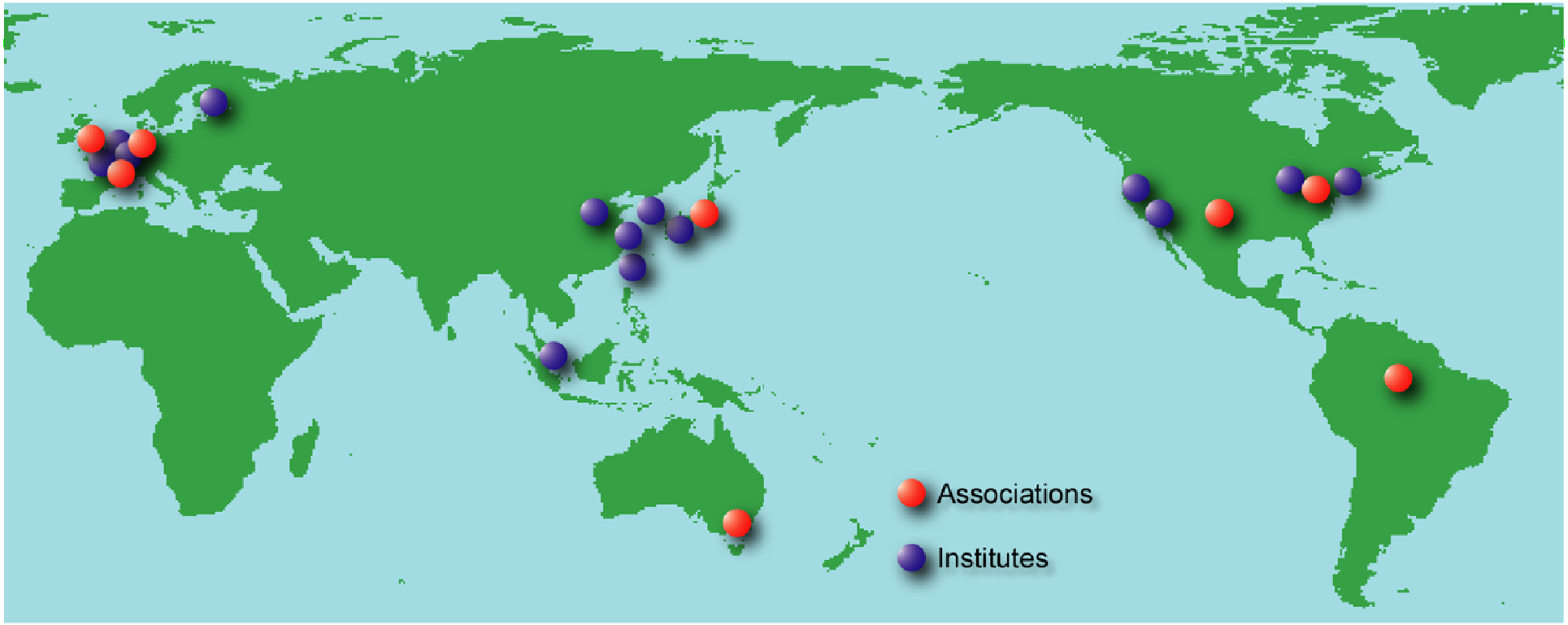
Supporting members: 48 companies and 2 organizations (as of March 1, 2011).

Exhibition Micromachine/ MEMS July 13-15, 2011 Tokyo, Japan

National R&D Project for MEMS



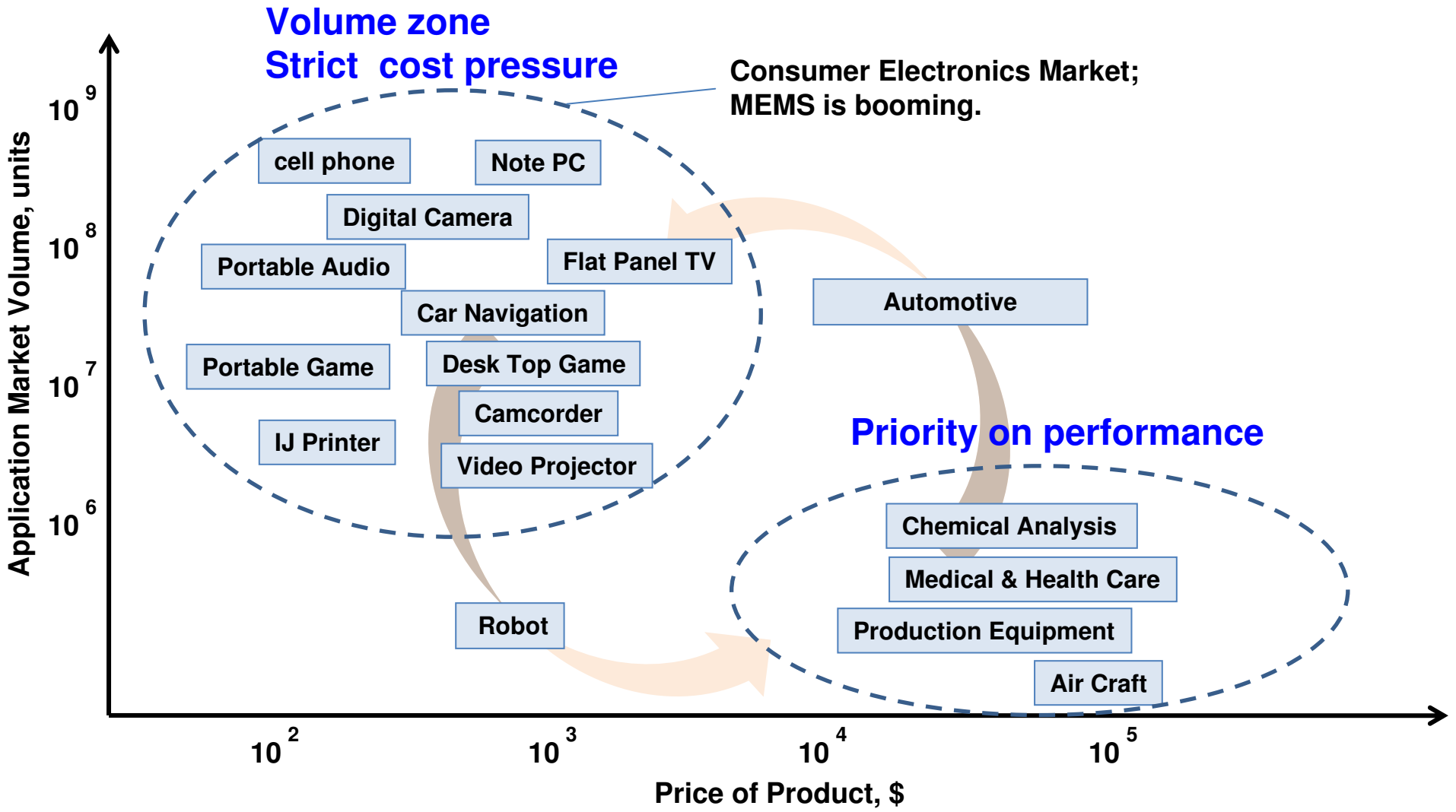
International MEMS & Micro-Nano Affiliates Network



iVAM Germany
MANCEF USA
MIG USA
NEXUS Switzerland
MNTNetwork UK
Fraunhofer ENAS
UC Berkley, BSAC USA
U of Michigan, WIMS USA
IMEC Belgie
SSTT China
SIMTech Singapore
SUFRAMA Brazil
IME Singapore
NTRA Korea
VTT Finland
NNMC USA
CEA-LETI France

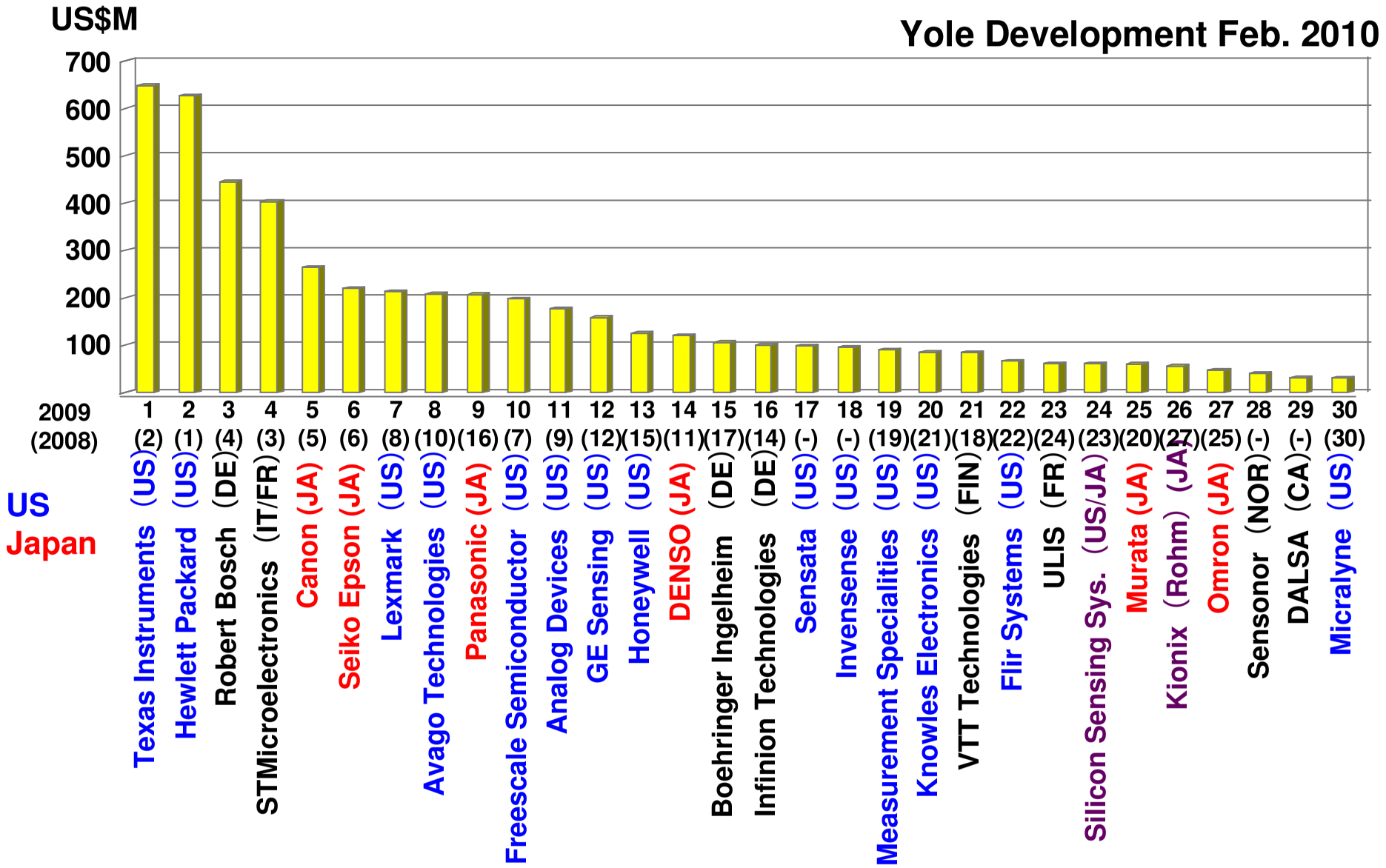
The landscape of Japanese MEMS R&D and Industry

MEMS applications, Price/Volume Map

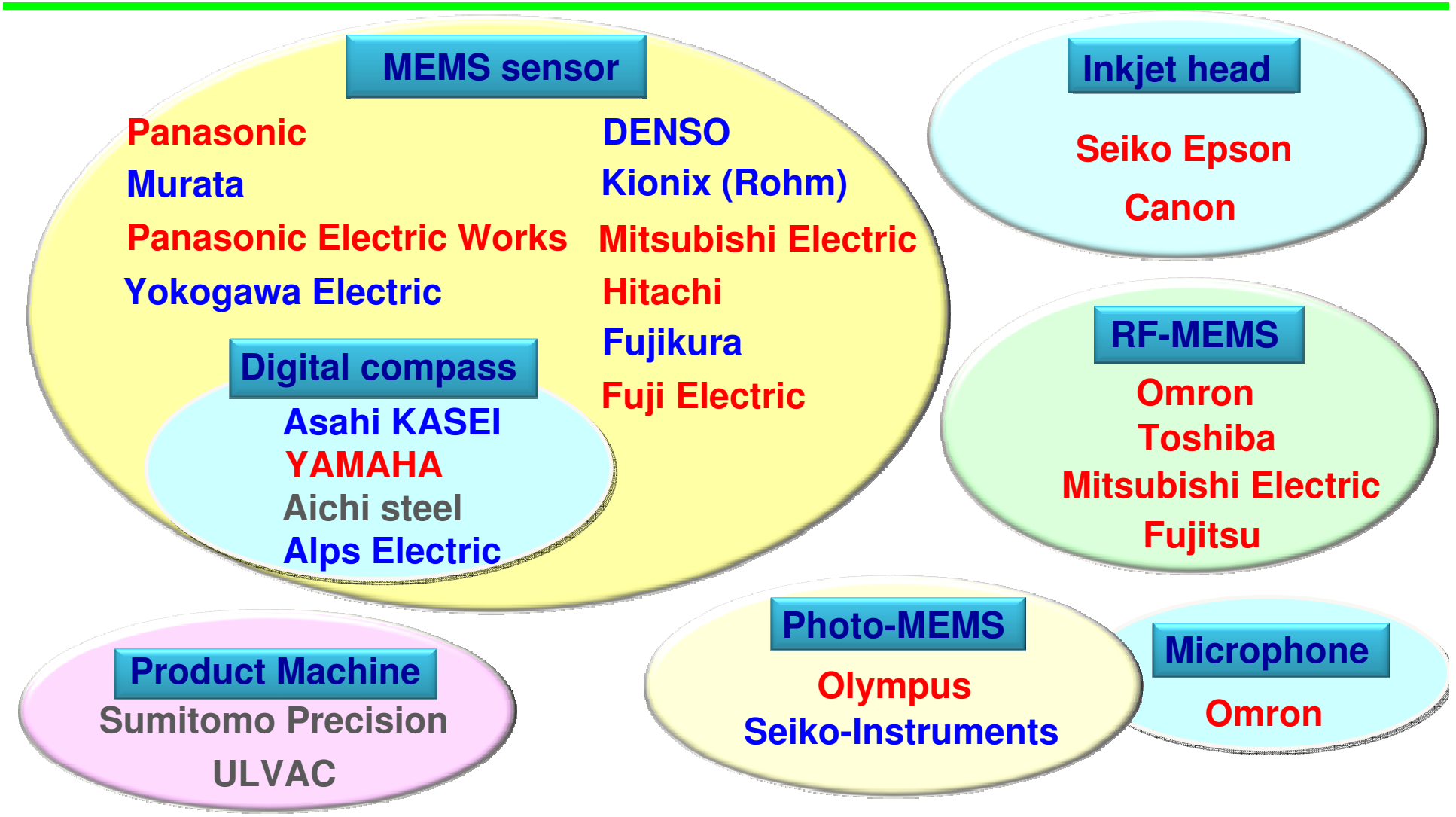


Japanese MEMS companies has a tough competition in volume zone

World Top 30 MEMS Companies in 2008 & 2009



Japanese MEMS Companies



Vertical Integration Maker (General electric company) or Large Device Maker

No Fabless Venture in Japan

Issues of Japanese MEMS Industry

(Depend on the companies)

Low developing speed from idea to product

Inferior cost competitive in high volume zone devices

	Vertical Integration Maker Large Device Maker with Captive Fab	Fabless venture + MEMS foundry
Company	World TI, Bosch, STMicroelectronics Japan Canon, Panasonic, Denso	World Invensense, Knowles, SiTime + TSMC, DALSA, Micralyne Japan Few fabless venture
Advantage	Well funded R&D, Collaboration, M&A Continuous R&D for long time Captive Fab: Black box kept in-house ⇨ High cost, Original devices with original process know-how	Less R&D investment High decision speed Take advantage of Outsourcing Standardized MEMS process ⇨ Low cost & High speed

Advantages of Japanese MEMS Industry

(Depend on the companies)

Developing core technology continuously and steadily

Innovative design corresponding to the application needs

Successful example

- Asahi KASEI Microelectronics : 3-axis Electronic Compass

- Type : Si-monolithic 3-axis geomagnetic sensor LSI

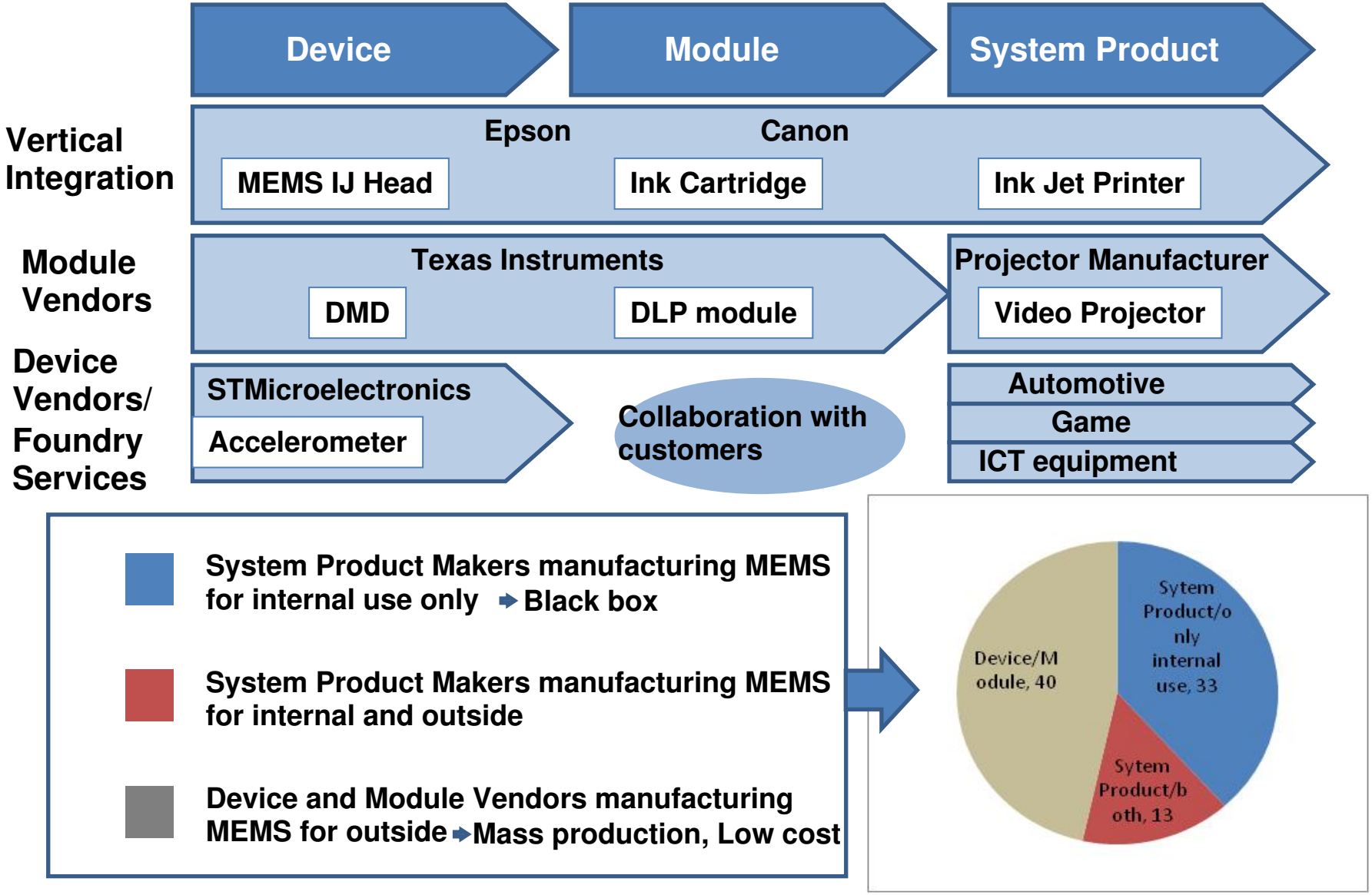
Success factor: LSI Design + Hall elements magnetic sensor

- Panasonic : Angular rate sensor

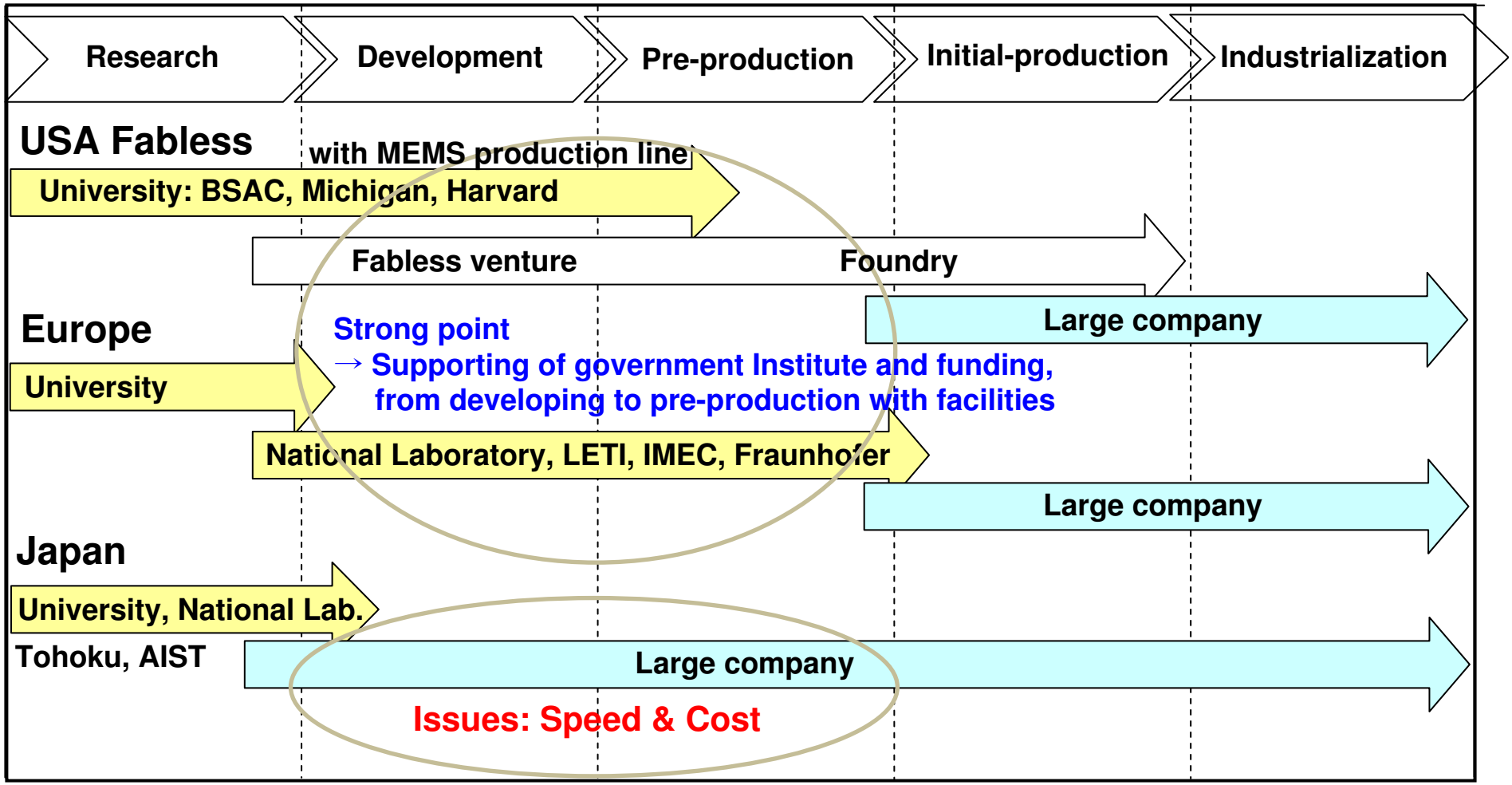
- Type : integrating two MEMS silicon tuning forks on which a piezoelectric thin film

Quartz vibration angular rate sensor + Piezoelectric thin film + Si MEMS fabrication (Black box technology)

Value-chains of Vertical Integration and Module Vendors



Supply-chain of USA Fabless, Europe, Japan



Issues of Japanese MEMS Industry

- Development speed, Cost competitive、foundation of Venture Company
- Supporting of Development ～ pre-production by government Institute and fund

→need to establish new institute

AIST activity in Tukuba, Japan

(National Institute of Advanced Industrial Science and Technology)

6 Core Research Domains related to Micro system

Nano-electronics

-New devices creation
-Integration with material and equipment
-45/60nm, 300mm line

Power Electronics

-Reliability more than 30 years
-Pilot production of SiC devices

N-MEMS

-Sensor networks
-Green fabrication process
-200mm/300mm line

Micro-Nano Open Innovation Center

Nano Material Safety

-Risk evaluation
-Control method to ensure nanomaterial safety

Green Nano

-Contribution to low carbon society
-Fundamental research

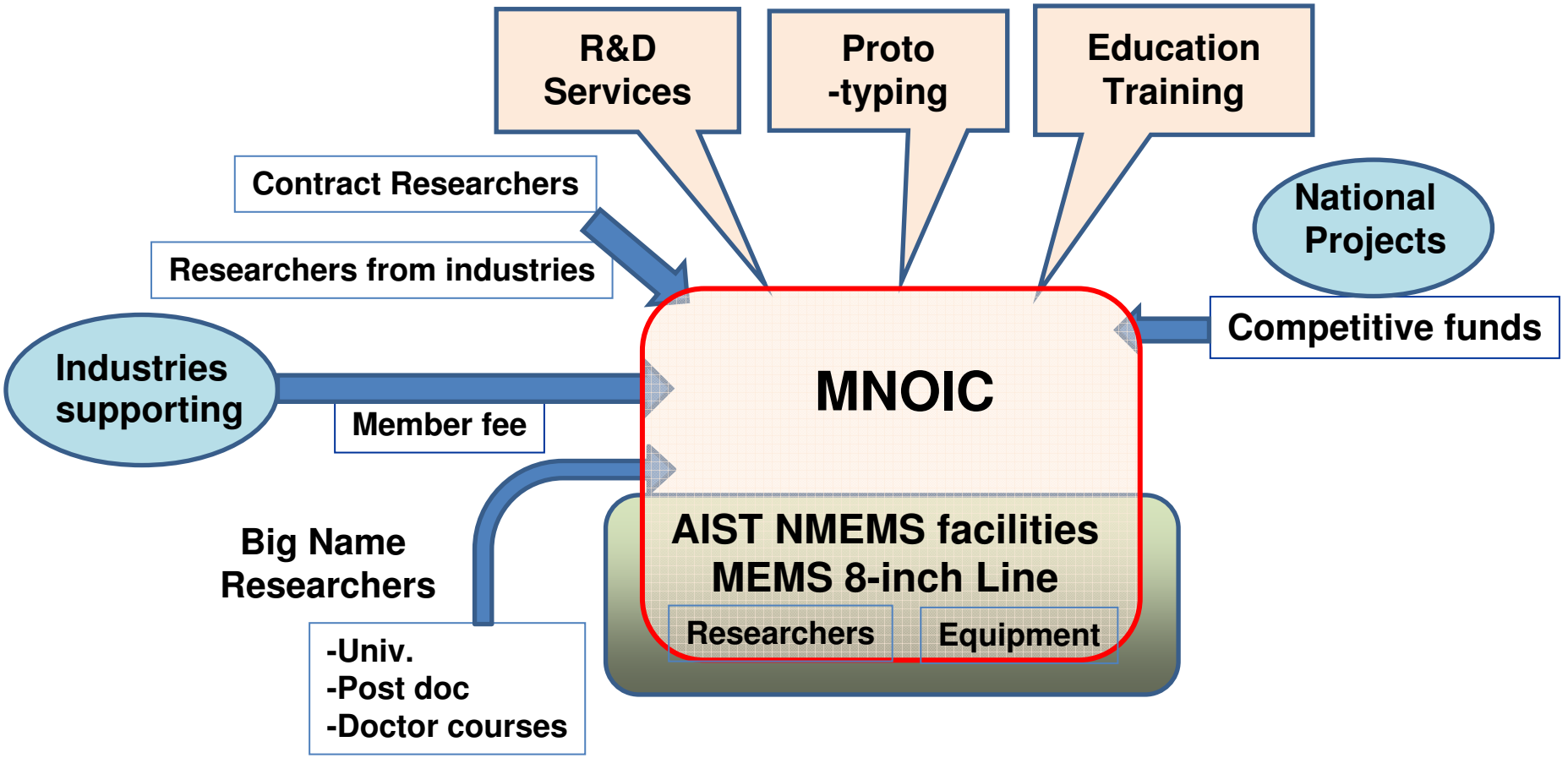
Carbon Nanotubes

-Application technologies
-Mass production technologies

Foundation of Micro-Nano Open Inovation Center (MNOIC)

MNOIC opens from April, 2011

Gather human resource, facilities, and funds



Summary

Advantage of Japanese MEMS R&D and Industries

- Developing core technology continuously and steadily
- Innovative design corresponding to the application needs

Issues of Japanese MEMS R&D and Industries

- Low developing speed from idea to product
- Inferior cost competitive in high volume zone devices

One of the solution

- Foundation of Micro-Nano Open Innovation Center (MNOIC)

Thank you for your attention!